Forest Health Technology
ENTERPRISE TEAM UPDATE

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WINTER 1999

Putting "Enterprise" into Enterprise Team

Examples of what is meant by the "Enterprise" in Enterprise Team are two current Team projects: The Research Budget and Attainment Information System (RBAIS) project and an aerial photography project for the USDA Natural Resources Conservation Service (NRCS).

RBAIS project

RBAIS is an Oracle™ database that tracks Research Station budgets for USDA Forest Service Research and Development from their earliest stages through the signing and completing of the final figures. The system, which is installed at every USDA Forest Service Research Station, also provides a means for tracking the Research Work Unit's findings and associated publications in its Attainment function. In addition, the data stored in RBAIS is used for compiling reports to the Washington Office Science Policy, Planning, and Information Staff.

USDA Forest Service

RBAIS Project Team: (from left) Judy Adams, USDA FS; Mark Riffe, Autometric Service Company; Jaideep Magdum, INTECS International; Glen Brink, Independent Contractor; Cindy Dalbey, INTECS International; Jim Bunch, INTECS International; Liz Williams, Autometric Service Company.

RBAIS was originally developed for the Forest Service's Data General (DG) system by the Science Policy, Planning, and Information Staff with the assistance of Rocky Mountain Research Station personnel.

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Inside . . .

Technology transfer meeting:

Team hosts Chilean group

A team of foresters from Chile visited Enterprise Team-Fort Collins December 7 and 8, 1998, to investigate ways to improve technology transfer. Mr. Osvaldo Ramirez of Ingeniero Agronomo led the Chilean team, which included Roy Wotherspoon Schrader of Corporacion De Fomento, Rodrigo Ahumada and Claudio Balocci of Bioforest S.A., Carlos Ramirez de Arellano of Forestal Millalemu S.A., Patricio Parra of Ingeniero Forestal, and Eduardo Montero, of Forestal Cholguan S.A. Bill Ciesla, retired from the Forest Service and now with Forest Health Management International, made a presentation about remote sensing in Chile, and Jose Negron, of the Research Work Unit on Alpine and Forest Ecosystem Dynamics under Atmospheric and Terrestrial Disturbances, from the USDA Forest Service Rocky Mountain Research Station, attended and assisted with translation.

The Chileans were interested in reviewing the technologies the Enterprise Team uses and develops. Enterprise Team Directors Allan

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RBAIS, NCRS, from page 1

However, with downsizing and retirements at the Station, and with the schedule for conversion of all major systems from the DG to the USDA Forest Service Corporate IBM System looming, RBAIS assistance was clearly needed.

About a year ago Science Policy, Planning, and Information staff approached the Enterprise Team with a proposal to convert RBAIS and historical data residing at each Station to the IBM system and to develop additional functionality to better meet current needs. The list of requirements was significant, but the challenge was increased by the absolute necessity of keeping to schedule. With the DG's being unplugged early in 1999 and the ongoing requirement for budget information, there was no room for delay. In the world of software development, where delays cannot always successfully be avoided, taking on such a project is not without risk.

But take it on the Enterprise Team did, and one year later the project is on schedule. "We're approaching the one-year mark, and so far, still on schedule for completion by the end of March," said RBAIS Program Leader Judy Adams. "The only way this task could have been accomplished was by highly skilled, productive individuals, even then it still held risk."

Besides Judy, RBAIS team members are: Glen Brink, recent Forest Service retiree and now independent consultant; Jim Bunch, Jaideep Magdum, and Cindy Dalbey of INTECS, International; and Liz Williams and Mark Riffe of Autometric Service Company. "Each person working on RBAIS contributed individual strengths to the project, but the synergism of the group is what really made this possible. The motivation and drive each person has shown towards this project are extraordinary," said Judy.

Why take on an enterprise project indirectly related to the Team's core programs and mission? There were good reasons. The challenges of the project produced not only a better RBAIS system for the Research Stations but also valuable database experience for the Team. Improving the knowledge base of this cadre of skilled individuals increases the level of support available for Forest Health Protection projects.

For RBAIS, the project produced a faster, more user-friendly, more streamlined database system than was available in its DG predecessor. Transfers of data from Stations to the Washington Office that had taken hours are now accomplished in minutes. For the Team, meeting the challenges and taking the risks produced valuable experience and skill, readily transferable to other Team projects.

NRCS project

A second important enterprise project being conducted by the Enterprise Team is an aerial photo project for NRCS. The Enterprise Team has been involved for over a year and a half in assisting NRCS to acquire aerial images of study plots for the National Resources Inventory. Key Team members for the NRCS project are Jim Ellenwood, Remote Sensing Program Manager, and Barry Russell, of INTECS, International.

The project is part of a national effort to track land use and natural resource conditions on non-federal lands and will assist NRCS in evaluating forest and rangeland health. The Enterprise Team's contribution is to provide 70 mm transparencies taken from the air at a map scale of 1:24,000 to serve as the baseline in this study. The plots will be resampled every five years.

Even though the Enterprise Team is involved in photographing only plots located in the western two-thirds of Colorado, the task is a large one. There are 3,458 primary

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ENTERPRISE TEAM UPDATE

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RBAIS, NRCS from page 2

sample units to photograph, and about five aerial photos are required for each plot, a total of 17,290 images.

The Enterprise Team took on this job a year ago as an enterprise project, with the NRCS paying the nearly $500,000 project cost. The benefits to NRCS include the receipt of high-quality images within a week of the completion of a flight at a cost below that available from a private service.

The project also has significant benefits for the Team. Personnel are learning skills which will be available for future Forest Service work in range health projects. Keeping our program funded is important in maintaining our capability, and the project's focus on the health of the land is directly related to our mission: to foster the development and use of technologies to protect and improve the health of America's forests.

Together, RBAIS and the NRCS aerial image acquisition project exemplify the reasons behind the enterprise component of the Forest Health Technology Enterprise Team. In providing valuable technical services on a cost-reimbursable basis for other Forest Service units or another agency, the Team is employing its skills, maintaining and improving its capabilities, and keeping its cadre of professionals intact and available for future projects, both those arising from our core Forest Health Protection assignments and other enterprise projects.

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Enterprise Team remote sensing capabilities

Equipment, capabilities, and services available on a cost-reimbursable basis (operating costs only)

• **Aircraft.** **The Enterprise Team operates a Forest Service-owned, pressurized Beechcraft KingAir-100 equipped with aerial photography, digital camera, and videography systems, a 20-inch optical window camera port, and electronic and visual navigation equipment. Maximum service altitude is 25,000 feet above mean sea level.**

• **Aerial Photography.** **The camera system is a Zeiss RMK 12/23 Mapping Camera (9x9-inch film format) with an 8 1/4-inch focal length lens. Calibrated by U.S. Geological Survey in Reston, VA in March, 1996, it was within USGS specifications and tolerances.**

• **Airborne Videography & Digital Camera.** **The video system consists of a Super-VHS color camera, recorder, color monitor for in-flight image control, and a camera mount. It is linked to a GPS unit through a caption generator that displays latitude/longitude, date, time, aircraft altitude, ground speed, and heading data on the video tape. The digital camera system is a Kodak DCS-420 color infrared digital camera linked to a GPS unit to record the position of the aircraft during the image acquisition. Image acquisition is linked to a laptop running a public domain software program which allows for the precise timing for image capture. The resulting images are written to a hard drive for later download to a CD.**

• **Image Acquisition.** **Color and color infrared photography can be acquired at photo scales ranging from 1:3000 and up. Scales are determined by the aircraft's altitude ceiling and the mean ground elevation of the photo area. For example, at a mean ground elevation of 5,000 feet, the maximum scale would be 1:30,000. Color video imagery can be acquired at swath widths ranging from 330 feet up to 2 miles on the ground. Photo and photo video coverage can be acquired in block areas, wall-to-wall coverage; sample points/ground plots; or sample strips/transects. Aerial photography is best suited to mapping activities such as larger block coverage or sample blocks. Airborne videography is best suited for low-level sampling type activities.**

• **Mission cost estimates & procedures.** **Total service package: mission planning, preparation of flight maps, acquisition of imagery, purchasing and processing of film, index map(s) of photo/video coverage, and delivery of end products to the customer/user. Costs vary according to factors such as scale/swath width, type of sensor and imagery, size of area, and ferry time to the area. To obtain a cost estimate, mail or fax a general map of the area to be covered and mission specifications. If the customer does not know mission specifications, the Team provides consulting on mission design. The Team prepares a cost estimate. When cost and mission parameters are determined and funds are transferred, the mission is carried out.**

• **Image analysis service & support.** **The Team maintains a lab equipped with photo interpretation, video analysis, and digital image processing equipment and can perform the photo interpretation/image analysis services for small projects on a cost-reimbursable basis. The Team also provides training in photo interpretation and airborne videography technology.**

For additional information on remote sensing capabilities and applications, or for a cost estimate, contact Jim Ellenwood, Remote Sensing Program Manager, USDA Forest Service, Forest Health Technology Enterprise Team 3825 E. Mulberry St., Fort Collins, CO 80524. Phone: 970-498-1778; Fax: 970-498-1660. E-mail:jellenwo/wo_ftcol@fs.fed.us

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Chilean group, from page 1

Bullard and Andy Mason provided an overview of the Team's programs.

Program Manager Jim Ellenwood, INTECS, International contractors Jeanine Paschke and Jonathan Marston, and Wallowa-Whitman National Forest detailer Eric Twombly provided demonstrations of Airborne Video/Digital Camera technology, Data Visualization, SmartForest, and INFORMS. Program Manager Loren Iverson discussed the Team's web site and web site development.

Talks also included possible followup on these technology activities and possible future contact regarding the Controladoro de Plagas Forestales, a biological control facility headed by Mr. Osvaldo Ramirez, to review the facility's capabilities and uses. The Chileans provided an explanation of the structure of forest pest management in Chile and Chilean forestry needs and activities in remote sensing, as well as a discussion of some pests of concern to Chilean forestry, notably *Sirex noctilio* (a wood wasp)*, the European pine shoot beetle, and three species of bark beetles introduced from Europe.

*Earlier in 1998 the Enterprise Team assisted EMBRAPA CNP Florestas of Columbo, PR, Brazil, in the publication of materials on the biological control of *Sirex noctilio*. The publication, FHTET 98-13 Proceedings of a Conference: Training in the Control of *Sirex noctilio* by the Use of Natural Enemies, is available from USDA Forest Service, Forest Health Technology Enterprise Team, 180 Canfield St., Morgantown, WV 26505; or call Lisa Cress, 304-285-1563 (Fax) 304-285-1564.

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Engineer on retainer moves to Morgantown

To integrate the Enterprise Team's engineering expertise and make its mechanical engineering programs more immediately responsive to the needs of forest health protection clients, Enterprise Team member Harold Thistle will move from his current location at the Missoula Technology and Development Center in Missoula, Montana, to the Enterprise Team Morgantown office in Morgantown, West Virginia, in mid-1999. Thistle heads the Forest Health Protection engineering program, made up of technical engineering projects which benefit forest health protection in the various Forest Service Regions. (One of his projects, the Sporax Applicator for Feller-Bunchers, was featured in the Autumn 1998 issue of the *Update*.) Once administered out of the former Enterprise Team office in Davis, California, the program includes development and technology transfer for the Forest Service spray drift model, Forest Service Cramer-Barry-Grim (FSCBG). Thistle, who has been with the Forest Service for seven years, has been heavily involved in the technical aspects of the program as well as administering the FSCBG and other projects since the closing of the Davis office.

As the Enterprise Team's primary liaison with MTDC, Thistle has played a leading role in setting Enterprise Team priorities in the development of mechanical engineering application technology. The move to Morgantown will more directly involve Thistle with the problems and issues faced by forest health protection professionals in the Regions and in field offices, thus increasing the Enterprise Team's responsiveness to these needs. Because of his close ties with MTDC, Thistle will also be able to serve as a pipeline to MTDC for mechanical application problems in need of solution. A recent example of Thistle's work is the Orchard Sanitation project, which provides methodology for removing tree debris (prime habitat for harmful insects and diseases) from seed orchards. This project, though small by some standards, provided large benefits for its eleven cooperators, many from the private sector. The Orchard Sanitation project also exemplifies the benefits of the "enterprise" approach, since all its funding came from sources external to the Forest Service.

"I'm happy about the move," said Thistle. "It will put me where I can have a better, more direct, relationship to our clients. I'll be able to better evaluate Forest Health Protection needs. We will be better able to base our program of work on collaboration with our clients."

Thistle will continue to spend about half his time working directly with

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You have a friend in engineering! MTDC is your "engineer on retainer" for FHP needs.

Engineer, from page 4

technical projects such as future development of the spray drift model and mechanical applications engineering. His remaining time will be devoted to administering the Enterprise Team's Equipment and Application Technologies programs under the direction of Enterprise Team Director Allan Bullard, also located in Morgantown.

"I am really pleased that Harold is joining the FHTET staff here in Morgantown," said Bullard. "With his knowledge of MTDC's capabilities, we will be in a much better position to address FHP needs in the areas of pesticide application and modeling, as well as equipment development, than we have been in the past. Of course, we will continue our relationship with MTDC, so I view this as a win-win situation for everyone."

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Analyst Hopman joins Team

The Enterprise Team welcomed Eunice Hopman as its budget analyst in mid February. She fills the vacancy left by the retirement of Margaret Means last November. Eunice's strong background in budget and administration includes experience as budget analyst for the Rocky Mountain Regional Office and past experience as an administrative officer with Job Corps in Nebraska and on the Mark Twain National Forest in Missouri and the Tongass National Forest in Alaska.

Earlier in her career, Eunice worked with the Methods Application Group, which became the Fort Collins office of the Enterprise Team, so her current job is something of a homecoming. "I have a breadth of experience, said Eunice, "and I've met a lot of people, in several Regions. It's neat; when you hear someone's name, you say, Oh, I know that person!' It's a real advantage."

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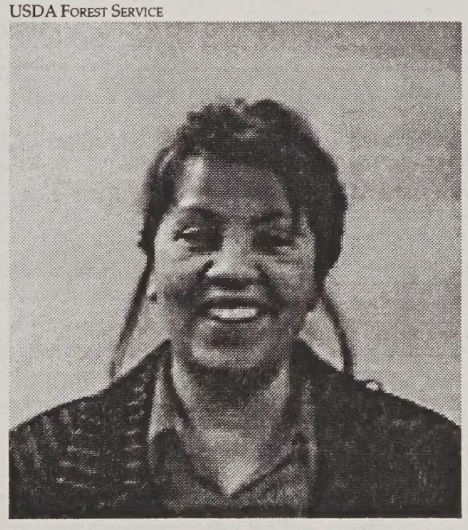

Eunice Hopman is Team's new budget analyst.

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Detailers assist STDP, WFHI programs

Information Management for the Enterprise Team encompasses a cluster of programs ranging from management of a National Program, the Special Technology Development Program(STDP), which funds short-term technology development projects undertaken by field offices, to the production of individual informational publications such as this quarterly newsletter. With the promotion of Patrice Janiga, Information Management Program Leader, to a position with the Washington Office Inventory and Monitoring Institute, several detailers from outside the Enterprise Team are rallying to help out in the interim as this vacancy is being filled.

Iral Ragenovich

The first to take time out from a busy schedule to help out the Team was Iral Ragenovich, Regional Entomologist from the Pacific Northwest Region office in Portland, Oregon. Iral's assignments there include management of the Region's STDP as well as interagency and international coordination.

While with the Enterprise Team, she was responsible for three major tasks: program management for the National STDP, preparing the final report for the Western Forest Health Initiative (WFHI), and preparing the Enterprise Team's 1998 Accomplishment Report.

As manager of a Regional STDP and a member of the review team which recommended last year's reorganization of the program, Iral is well qualified to handle details of STDP program management. She points out that the STDP is a necessary vehicle for funding short-term research projects required by the specific needs of field offices, since Forest Service units such as the Enterprise Team normally undertake mid- and longer-term development projects that provide technical assistance to land managers and other customers.

The WFHI was chartered by the Chief of the Forest Service in September 1994 to determine priority actions concerning forested ecosystems in the West. Originally a two-year program, it was intended to identify westwide opportunities for improving forest health. Projects were designed to achieve a number of forest health benefits, including

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Projects increase biopesticide choices

The Enterprise Team Biopesticide Program in Morgantown, WV cooperates and coordinates with universities, other federal and state government agencies, and private industry to identify and enhance the use of biopesticides as part of integrated pest management (IPM) programs. This includes the development of biopesticides to increase the range of alternatives available to resource managers. The Team and its cooperators completed one such project in Fiscal Year 1998: the preliminary evaluation of the ability of 4-allylanisole (4-aa), a host-produced inhibitor, to repel southern pine beetle (4-aa is used to protect high value, single trees from attack). Performed in cooperation with Jane Hayes and others at the Southern Research Station, the project evaluated 4-aa for protection of red-cockaded woodpecker cavity trees using several types and placement patterns of dispensers.

Of the nine projects continuing into Fiscal Year 1999, six involve entomopathogens: the fungus *Entomophaga maimaiga*; the virus products Gypchek and TM-Biocontrol the bacterial product *Bacillus thuringiensis* var. *kurstaki*; two semiochemicals; and one sampling methodology.

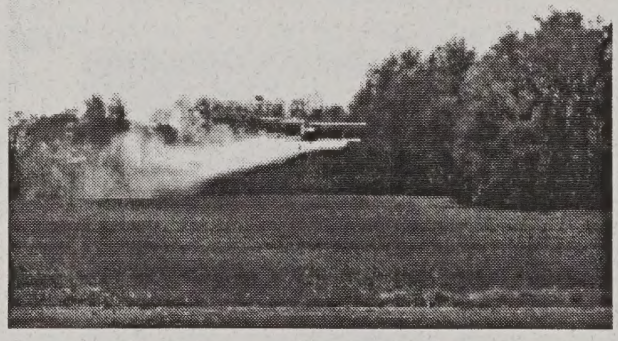
Entomophaga maimaiga

This fungus project monitors nontarget Lepidoptera (other than gypsy moth) in the U.S. And Canada for *E. maimaiga* infection; the program also examines population dynamics, rate of infection, and spread studies. *E. maimaiga* was introduced into the US about 1910, but except for its year of release, it had not been recovered in the forests until 1989, when it was found to be causing extensive mortality of gypsy moth larvae in Connecticut and several surrounding states. Since 1989, the fungus has spread throughout the area generally infested by the gypsy moth. *E. maimaiga* is a strong candidate for use as a bioinsecticide for gypsy moth. (For this to take place, registration with U.S. Environmental Protection Agency, development of a laboratory production technique, formulation development, and field efficacy trials need to be completed.

Gypchek

Another project focuses on the gypsy moth nucleopolyhedrosis virus product Gypchek. The project's goal is to develop a commercially produced carrier to be used with Gypchek. To work efficiently, the carrier must:

- protect the virus from ultraviolet light and washoff by rain
- stimulate feeding by early instar gypsy moth larvae
- move through aerial and ground application equipment without plugging it
- be cost effective for operational use in suppression, eradication and slow-the-spread projects



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Spray plane deposits gypsy moth nucleopolyhedrosis virus product Gypchek and Carrier 038 for control of gypsy moth

The currently used carrier, Carrier 038, is marketed by Abbott Laboratories (N. Chicago, IL). Although it provides excellent protection for the virus, it is susceptible to washoff and is relatively expensive (approximately nine dollars per acre). The Enterprise Team, in cooperation with Janet Stockhausen of the USDA Forest Service Patent Program, developed a technology license and development agreement with Abbott laboratories that provided rights to the Forest Service for formulation development.

TM-Biocontrol

A third project seeks to identify a consistently effective field dose for the Douglas-fir tussock moth (DFTM) nucleopolyhedrosis virus product TM-Biocontrol. Approximately 400,000 acre equivalents (enough product to treat 400,000 acres) of TM-Biocontrol is currently stored in Corvallis, OR for use against expanding DFTM populations. However, samples of various production lots of the virus have only been bioassayed against a laboratory strain (Goose Lake) of DFTM. The task of ascertaining an effective field dose remains to be done. The Enterprise Team, in cooperation with Iral Ragenovich (Pacific Northwest Region Forest Health Protection) developed a cooperative agreement with Imre Otvos of the Canadian Forest Service to bioassay representative lots against wild strains of

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Biopesticide choices, page 6
DFTM and eventually to conduct small-scale field trials.

Bacillus thuringiensis var. *kurstaki* (*Btk*)

Three projects seek further information about the commercially produced biopesticide *Bacillus thuringiensis* var *kurstaki* (*Btk*). *Btk* is the most widely used biopesticide worldwide, accounting for over 80% of the biopesticide market. One project aims to develop a technique to distinguish among *Btk* spores which are found naturally in the soil and those found in commercial products. This effort is being conducted in cooperation with Intermountain Region Forest Health Protection and by means of a cooperative agreement with the Bioremediation Laboratory at Weber State University in Ogden, UT. Various *Btk* samples from commercial products used in forestry worldwide have been analyzed, and their spores can be distinguished. The next step is to analyze *Btk* samples from soils from various geographical locations in the U.S. and Canada. Finally, the project will conduct limited spray trials to determine our ability to distinguish among the various strains of *Btk*.

A second *Btk* project is a major, five-to-seven-year effort to determine nontarget impacts from multiple applications of *Btk* and Gypchek to moderate-density gypsy moth populations on the George Washington National Forest in Virginia and the Monongahela National Forest in West Virginia. The project has completed collection of data from two years before treatment through two years after treatment. A minimum of one additional year of after treatment monitoring is required.

Another *Btk* project involves the development of aerial application technology for pine plantations and seed orchards. The initial efforts of our study focused on tip moth phenology and the impact of several of the chemical insecticides used to control tip moth populations on their natural enemies. Laboratory bioassays are being conducted to determine the LD50 and LD95 values for several chemical insecticides, one insect growth regulator, and Btk.

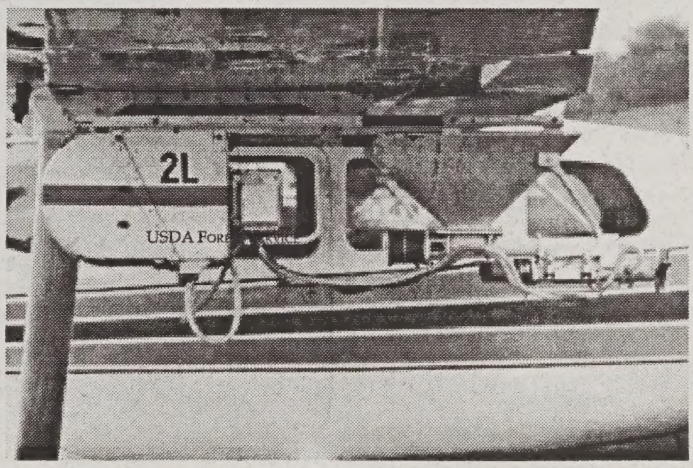
Semiochemicals

One semiochemical project is to develop aerial spray systems to apply the slow-release plastic flake formulation containing racemic disparlure to manage low-density populations of gypsy moth. The currently used spray system for fixed wing aircraft is cumbersome to mount beneath the aircraft's front wing as well as being limited in the acreage covered per aircraft load. The project developed two prototype systems, both inexpensive and easy to use on most fixed wing aircraft. One is in the initial stages of development through a cooperative agreement with Schiffer Aerial Service of Ovid, MI. This system uses a spreader device to dispense the flakes and hydraulic nozzles to apply the sticker, employing two or three units per plane. The other, undertaken through a cooperative effort with the USDA Animal and Plant Health Inspection Service (APHIS), the USDA Agricultural Research Service (ARS), and the Missoula Technology and Development Center (MTDC), is in the final stage of its development. This is a slurry system utilizing two especially modified, standard AU-5000 rotary atomizers.

A second semiochemical project will develop mass-trapping technology for the spruce beetle. Specifically, the project undertakes to develop the optimal composition of trap lures for spruce beetle and to compare the efficacy of a new prototype bark beetle pheromone trap to that of the existing standard multiple-funnel trap.

Sampling methodologies

A continuing project is to clarify sampling methodologies for use in IPM programs for shade tree and forest insect pests. This project will produce an annotated bibliography of publications that provide information on sampling tactics for insect pests of landscape and forest trees, a comprehensive publication that describes operational sampling protocols, and a searchable world wide web site.



Current pod system for applying pheromone flakes

New projects

Two new projects begin in Fiscal Year 1999. The first will seek to

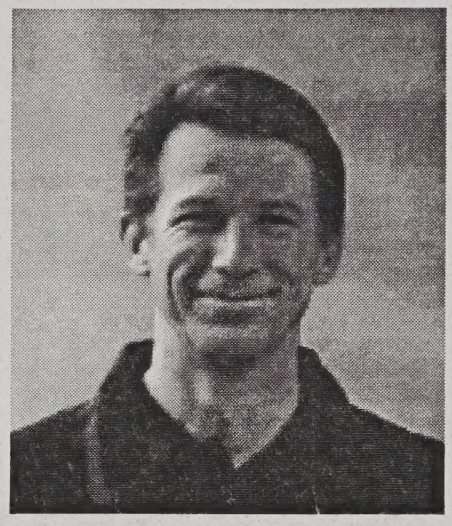
See **Bioesticide choices**, page 11

Reyna joins Team as DSS Program Manager

Nick Reyna, a forest economist with the USDA Forest Service working on the Interior Columbia Basin Ecosystem Management Project, located in Walla Walla, Washington, has joined the Enterprise Team as of March 1999, serving as Decision Support Systems Program Manager.

At his previous post, Nick was responsible for the economic and social aspects of the Interior Columbia Basin Ecosystem Management Project, a joint Forest Service-Bureau of Land Management effort to develop a scientifically sound ecosystem-based land management strategy for the 71 million acres managed by these agencies in the Interior Columbia Basin. Through the project, Nick interacted with County governments, economic development interests, Federal agencies, citizen advisory committees, a variety of interest groups, and the public. He has a broad background in decision support at national, regional, and local levels.

Nick comments about his experience: "I've been involved with a broad scale planning effort incorporating many different disciplines. We've been pushing the envelope. After five years we are still challenged, trying to integrate all the different resource areas and multiple scales, from broad-scale to individual forest. It's a very complex problem, involving multi-agency approval, differing biological opinions, and laws such as the Endangered Species Act. There are many parallel efforts out there, all attempting to solve the same problem. The trend toward broad-scale assessment is clear. It's an area ripe for investigation."



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Nick Reyna joined the Enterprise Team in March 1999. He serves as Decisions Support Systems Program Manager.

Asked how he thought this experience would transfer to the Enterprise Team, he said, "I have a strong desire to make a contribution, to make a difference. I also know that it's not easy to bring new tools to help the busy land manager, but I am interested in exploring how the Enterprise Team might fit into broad-scale decision support efforts, because there is a need."

Before working on the Interior Columbia Basin project, Nick was a policy analyst in the USDA Forest Service Washington, DC, headquarters, specializing in timber management issues. Nick has also worked in forest economics research for the USDA Forest Service Pacific Northwest Research Station and as a field forester on the Umpqua and Willamette National Forests in Oregon. He has a Bachelor of Science degree in Forest Management and a Master of Science degree in Forest Policy, both from Oregon State University. Nick has worked for the Forest Service since 1977.

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Detailers, from page 5

fuels reduction, watershed improvement, wildlife habitat, and timber stand improvement. Since additional time was needed to implement the WFHI program, the program was monitored for an additional two years. Iral compiled the draft final report for this effort.

The third project during Iral's detail was drafting the Fiscal Year 1998 Enterprise Team Accomplishment Report. In the past, this report has followed the format of the Annual Program of Work, a necessarily lengthy and detailed document. Under Ragenovich's leadership, the report will be streamlined and shortened into a more user-friendly "highlights" document, more succinct, easier to read, and therefore more useful to our clients and customers.

Asked about interrupting her normal schedule for this detail, Ragenovich said, "I've enjoyed doing it. I don't view this assignment as professional development, since I already have experience in these tasks, but I am happy to be able to help out the Team."

Duane Nelson

Duane Nelson, Forest Health Coordinator from the Institute of Pacific Island Forestry in Hilo, Hawaii, spent three weeks as a detailer program manager for the Enterprise Team's Information

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Management program. Duane admitted to a bit of climate shock adjusting to the difference between Colorado and Hawaii in February. Back home in Hawaii, Duane works with cooperators from State agencies, other Federal agencies, and private landowners to control nonnative forest weeds. A forester, silviculturist, and program manager, he also spends time working on other Forest Health issues such as diseases and insects.

A 1978 honors graduate in Management from the University of Missouri, Duane has done graduate study in silviculture at Washington State University and the University of California at Berkeley. Since joining the USDA Forest Service in 1979, Duane has served as a silviculturist, land management planner, fire recovery team leader, sale administrator, and district silviculturist, working for the Pacific Southwest Regional Office and the Eldorado and Lassen National Forests.

During his time with the Enterprise Team, Duane concentrated on updating the Special Technology Development Program (STDP) web page and completing various reports for the STDP Steering Committee, scheduled to meet late in March 1999. He also put the finishing touches on the Enterprise Team's 1998 Accomplishment Report.

"I've enjoyed the opportunity to meet and interact with Enterprise Team staff," he said, "and also the opportunity to enjoy mountains with pine trees in them."

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Recent publications

Winter 1999

Thistle, Harold; Skyler, Pat. 1999. Eighth report: national spray model and application technology working group. 9934-2810-MTDC. Missoula, MT: USDA Forest Service, Technology and Development Program. 54 p.

Abstract

Report of 1998 USDA Forest Service National Spray Model and Application Technology Working Group Meeting, held July 15 and 16, 1998, in Orlando FL, in conjunction with the International Meeting of the American Society of Agricultural Engineers (ASAE). The contents of the report are notes taken during the meeting and submissions from attendees. (Notes are not to be interpreted as verbatim statements.) An attendee list with contact and other information is included. Topics covered are: Windbreak Cooperative Effort; Pesticide Spray Coverage Analyzer; Visualization and Quantification of Spray Drift; Status on the Modeling of the Aerial Application Rates of Pesticides; Significant Model Improvements from AGDISP to AgDRIFT; Spray Drift Task Force Model Evaluation, and a Summary of notes from Forest Service Work Planning Session, Oconomowoc, WI, held May 14, 1998.

For further information contact Harold Thistle, PDC, Fort Missoula, Building No. 1, Missoula, MT 59801 (until June 30, 1999). After July 1, 1999, Harold Thistle, Forest Health Technology Enterprise Team, 180 Canfield St., Morgantown, WV, 26505.

Thistle, Harold; Jasumback, Anthony; Karsky, Richard; Trent, Andy; Windell, Keith. 1998. MTDC/FHP 98 Achievements. 9834-2856-MTDC. Missoula, MT: USDA Forest Service, Technology and Development Program. 12 p.

Abstract

The Forest Health Protection Program at Missoula Technology and Development Center (FHP/MTDC) is designed to provide engineering and technical services to FHP Staff. During FY 1998, the program produced 13 documents, including three Forest Service Reports, eight Proceedings papers, and two peer-reviewed journal articles. The program included various hardware development efforts. Three mechanical systems are now being tested in Forest Service applications as a result of this year's efforts. Engineering Services achievements included attendance at national meetings, seed orchard cone sanitation, edge-flow modeling work, DGPS in spray aircraft guidance; meteorological support of FHP operations, spray drift mitigation, and a stump applicator for feller bunchers. An area of increased interest is the use of insect pheromones in pest management strategies. The program includes projects in pheromone dispersion and pheromone application equipment. Other projects covered are: decision support system testing and enhancement; FSCBG real-time modeling; and a stationary tree sprayer for use in hemlock protection.

FHP Director moves on

On January 3, 1999, Forest Health Protection Director Ann Bartuska became Director of Forest Management in the National Forest System of the USDA Forest Service. Bartuska was instrumental in the concept and establishment of the Forest Health Technology Enterprise Team; she provided dynamic leadership and guidance to the team since its establishment in May of 1995. She has been very active in promoting the Enterprise Team to all Forest Service staffs. We look forward to working with her in her new role to help forge even stronger relationships between the Team and Forest Management. Until a new Forest Health Protection Director is named, Deputy Director Melvin Weiss has been named Acting Director; Robert Mangold is Acting Deputy Director.

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Aerial sketchmapping goes digital

The Enterprise Team and Remote Sensing Applications Center (RSAC) in Salt Lake City, UT are at work developing a system that uses electronic tools to enhance USDA Forest Service aerial sketchmapping capabilities.

The USDA Forest Service has conducted aerial sketchmapping for forest health protection since the 1950s. A sketchmapper flies the area to be surveyed in a small, high-winged monoplane at elevations of 1,000 to 1,500 feet above ground. Tracking the plane's location on a hardcopy map or aerial photograph, the sketchmapper sketches areas of forest damaged by pests or weather events. The hardcopy sketch goes to the appropriate National Forest, where the sketched features are digitized into a Geographic Information System (GIS). These data help managers to develop management options and create monitoring reports.

This rather rough-and-ready process has some problems. Sketched features can be inaccurate, since the sketchmapper must juggle numerous maps in the cockpit of a low-flying small plane while keeping track of the aircraft's position on the map and relating topographic features seen on the ground to those recorded on the map. At typical airspeeds of 175 to 200 knots, the mapper has about 15 seconds per square mile to locate, sketch, and attribute features. Other disadvantages are the time lag (as much as six months) and the cost of personnel back at the office to digitize the sketched features.

Advances in GIS, the Global Positioning System (GPS), and computer technology suggested the feasibility of developing a digital system that links its map display to a GPS receiver (an icon on the display representing the current position of the aircraft) that can also digitize and attribute points, lines, and polygons clearly and quickly.

To operate efficiently, such a system would also have to be able to collect the GPS log file of the flight, export files in appropriate format, save data automatically, update the screen map display as the plane moves, be operable under harsh conditions (32 to 120 degrees F, high humidity, dust), and allow input by means of a touch screen and stylus. And the electronic system must operate more accurately than the current manual system at a reasonable cost. Finding and testing hardware and software to accomplish all this is the task of the Enterprise Team's and RSAC's Digital Aerial SketchMapping Project.

After reviewing and testing several commercial off-the-shelf software systems, the project team selected a program called GeoLink PowerMap by GeoResearch, Inc., of Billings, MT. Under a General Services Administration special services contract, GeoResearch agreed to modify its off-the-shelf product to meet Forest Service sketchmapping needs. The resulting software allows the sketchmapper's laptop computer screen to display the aircraft's position, along with user-defined topographical features, as icons. (The displays were created using digital raster graphics (DRG) forms of the 1:100,000 scale USGS 30 x 60-minute quadrangle maps typically used by sketch mappers.)

The observer then selects the icon corresponding to what he sees, sketches the feature on screen, and records attributes by selecting a "log" button. The map display automatically updates as the plane flies over different territory. After the mission, the sketched features are translated into an appropriate format and copied onto a floppy disk for transfer to a GIS.

Several hardware solutions were reviewed and tested. The current solution involves a laptop PC with a Pentium 133 Mhz processor and 48 megabytes of RAM, an external touchscreen monitor, and a GPS receiver, all powered independently of the aircraft with a 12-volt battery and DC/AC power inverter. The antenna for the GPS receiver clamps to the aircraft window, and the GPS signal enters the PC via a special card and serial port connection.

The system costs less than $6,000 and is flexible: both laptop PC and GPS receiver can be used for other purposes. But it is also cumbersome. The user must juggle many components and cables in a small space and take special care that connections are kept stable during flight. Installing a special rack or connecting the system to the aircraft's GPS and power supply would require using the same aircraft for each sketchmapping mission.

The Project demonstrated the system to personnel on the Sam Houston National Forest in 1998. Further testing suggested the need for greater accuracy for the Southern Region, as mapping southern pine beetle infestations requires that small areas (as few as three trees) be recorded and digitized. Part of the problem is that National Map Accuracy Standards for the

See **Sketchmapping**, page 11

Sketchmapping, from page 10

1:100,000 scale maps allow point features to be off as far as 166 feet. A possible solution is using digital orthophoto quads (DOQs) instead of the 1:100,000 scale maps. DOQ standards allow an error of no more than 40 feet for point features. DOQs also improve accuracy by including more features for the sketcher to reference.

Loading the software on a more powerful computer with more RAM improves performance considerably. A laptop PC with a 300 Mhz processor and 288M of RAM is part of the next stage of testing. The Team is also investigating pen-based computers.

Demonstrations are planned at the 1999 Aerial Survey Technical Working Group Meeting in Minneapolis, MN, the Forest Health Monitoring Meeting in St. Louis, and the Pacific Northwest Region Incident Commanders training in Hood River, OR. Plans are to get the system at Sam Houston National Forest functioning for the 1999 season.

Although the digital sketchmapping system is still a work in process, the project has made significant advances toward a system that will be "a tremendous leap forward for aerial sketchmapping," according to RSAC's Charlie Shraeder-Patton. Cost-saving benefits for the Regions are estimated at between $7,000 and $15,000 per year, primarily in reduction of time needed for post processing data. Harder to calculate is the dollar worth of reducing the time lag from collection to delivery of data to as little as two weeks. The Sketchmapping Team has produced two interim reports:

Thistle H; Greenfield P; McConnell T; Myhre R; Rankin L. 1996. Sketch mapping interim report. FHTET 96-31. Davis, CA: USDA Forest Service, Forest Health Technology Enterprise Team. 35 p.

Schraeder-Patton, C. 1999. Digital aerial sketchmapping: interim project report, January 1999. Salt Lake City, UT: USDA Forest Service, Remote Sensing Applications Center. 15 p.

For more information about the Digital Aerial SketchMapping Project, contact Charlie Schraeder-Patton, Remote Sensing Applications Center, USDA Forest Service, 2222 West 2300 South, Salt Lake City, UT 84119.

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Biopesticide choices, page 7

develop insecticides to control, and pheromones to survey, Asian longhorned beetle. The beetle is a recent invader of the Brooklyn and Queens, NY and Chicago, IL areas, attacking numerous species of hardwoods. The current eradication program relies on the destruction and removal of all infested host material. These studies are being conducted in the People's Republic of China in cooperation with Beijing University, the Chinese Academy of Forestry, and USDA APHIS.

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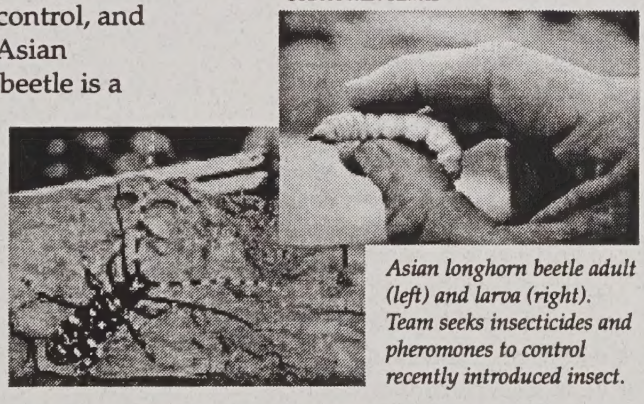

Asian longhorn beetle adult (left) and larva (right). Team seeks insecticides and pheromones to control recently introduced insect.

The second new project will predict the risk of stand deterioration following spruce beetle management activities. This effort is being conducted in cooperation with Intermountain Region FHP and by means of a cooperative agreement with Utah State University in Logan, Utah.

An important component of the Biopesticide Program is the publication of technical information to assist in the transfer of biopesticide technology. The Team recently published five documents on biopesticide subjects. See the sidebar on this page for titles and ordering information.

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Biopesticide Publications

Reardon RC; Leonard DS; Mastro VC; Leonhardt BA; McLane W; Talley S; Thorpe KW; Webb RE. 1998. Using mating disruption to manage gypsy moth: a review. FHTET 98-01. Morgantown, WV: USDA Forest Service, Forest Health Protection, Forest Health Technology Enterprise Team. 85p

Skillen EL; Berisford CW; Camann, RC; Reardon, R. 1997. Semiochemicals of forest and shade tree insects in North America and management applications. FHTET-96-15. Morgantown, WV: USDA Forest Service, Forest Health Protection, Forest Health Technology Enterprise Team. 182 p.

Gebhardt AE; Holmes S; Reardon RC. 1997. Bioinsecticides for forest and shade tree defoliators: annotated bibliography of nontarget impacts. FHTET 97- 05. Morgantown, WV: USDA Forest Service, Forest Health Protection, Forest Health Technology Enterprise Team. 183 p.

Reardon RC; Podgwaite J; Zerillo R. 1996. Gypchek—the gypsy moth nucleopolyhedrosis virus product. FHTET 96-16. Morgantown, WV: USDA Forest Service, Forest Health Protection, Forest Health Technology Enterprise Team. 33 p.

Reardon, RC; Hajek AE. 1998. The gypsy moth fungus Entomophaga maimaiga in North America. FHTET 97-ll. Morgantown, WV: USDA Forest Service, Forest Health Protection, Forest Health Technology Enterprise Team. 22 p.

For more information about these projects and for copies of the publications noted above, contact: Richard C. Reardon, USDA Forest Service, Forest Health Technology Enterprise Team, 180 Canfield Street, Morgantown, WV 26505 (e-mail= rreardon/na_mo@fs.fed.us).

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Events of Interest

April 13-14, 1999. Fort Collins CO Forest Health Protection Directors Meeting. Possible Topics: PTIPS review; FHP strategy charter; FHP Remote Sensing evaluation; FY 2000-2001 budget priorities; Risk Map update.
Contact: Andy Mason, USDA Forest Service, Forest Health Technology Enterprise Team, 3825 E. Mulberry St., Fort Collins, CO 80524; Phone: 970-498-1500; Fax: 970-498-1660; e-mail: amason/wo,ftcol (Forest Service System) or amason/wo_ftcol@fs.fed.us (outside Forest Service System).

September 15-17, 1999. Madison WI IUFRO Working Unit 4.11.03: Expert systems and information management. Ninth workshop on artificial intelligence and related topics.
Contact: Daniel L. Schmoldt, Ph.D.. USDA Forest Service, Brooks Forest Products Center, Virginia Tech, Blacksburg VA 24061-0503. Phone: 540-231-4674; Fax: 540-231-8868. Web site: www.ersac.umn.edu/iufro/iufronet/d4/hp41103.htm
Registration information at: http//www.srs4702.forprod.vt.edu/meetings/AI_Workshop/sept99.html